

United States Patent [19] Suzuki

[11] Patent Number: 5,803,975
[45] Date of Patent: Sep. 8, 1998



[54] MICROWAVE PLASMA PROCESSING APPARATUS AND METHOD THEREFOR

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[21] Appl. No.: 806,070

[22] Filed: Feb. 25, 1997

[30] Foreign Application Priority Data

Mar. 1, 1996 [JP] Japan 8-044884
Mar. 14, 1996 [JP] Japan 8-057288

[51] Int. Cl. 6 C23C 16/00

[52] U.S. Cl. 118/723 MW; 118/723 ME;
118/723 MA; 118/723 MR; 156/345; 204/298.38;
438/726; 438/727; 438/728; 427/575

[58] Field of Search 118/723 R, 723 E,
118/723 MW, 723 ME, 723 MR, 723 MA;
156/345; 204/298.38; 438/726, 727, 728;
427/575; 422/186, 186.04, 186.05, 186.29,
906

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[57] ABSTRACT

For generating uniform high-density plasma over a large area with a low power thereby achieving high-quality plasma process at a high speed even at a low temperature, there is provided a microwave plasma processing apparatus comprising a plasma generation chamber having a periphery separated from the ambient air by a dielectric member, microwave introduction means utilizing an endless annular wave guide tube provided around the plasma generation chamber and provided with plural slots, a processing chamber connected to the plasma generation chamber, support means for a substrate to be processed provided in the processing chamber, gas introduction means for the plasma generation chamber and the processing chamber, and evacuation means for the plasma generation chamber and the processing chamber, wherein the circumferential length L_x of the endless annular wave guide tube, the wavelength λ_x of the microwave in the endless annular wave guide tube, the circumferential length L_z of the dielectric member and the wavelength λ_z of the surface wave propagating in the dielectric material substantially satisfy a relationship:

$$L_x/\lambda_x = (2n+1)L_z/\lambda_z$$

wherein n is 0 or a natural number.

59 Claims, 9 Drawing Sheets

